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REMARKS

Claims 1-3, 11-16 and 20-25 are pending in this application for the Examiner's review and consideration. Claim 1 was amended to include the feature of claim 14 that the refractive index of the low refractive index layer is between 1.30 and 1.65 *(See e.g.*, Specification, page 9, lines 3-7). Accordingly, claim 14 was amended to delete this feature. No new matter has been added so entry of the claims at this time is warranted.

THE REJECTION UNDER 35 U.S.C. § 103(A)

Claims 1-3, 11-16, 20-23 and 25 were rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,073,451 to Iida et al. ("Iida") in view of U.S. Patent No. 5,800,933 to Hartig et al. ("Hartig") for the reasons set forth on pages 2-3 of the Office Action. Applicants respectfully traverse the rejection.

Iida discloses a heat insulating glass plate with a multilayer coating which has low transmittance for solar radiation, high transmittance for visible light and radio waves, good durability, and suitability for use as a vehicle window glass (*See e.g.*, Iida, column 2, lines 39-44). Iida also discloses that the multilayer coating is a lamination of transparent and dielectric layers and has three essential layers in which the middle layer is higher or lower in refractivity than the inner and outer layers (*See e.g.*, Iida, column 2, lines 45-56). Specifically, Iida discloses a multilayer coating having a first layer with a refractive index in the range of 1.8-2.1, a second layer with a refractive index in the range of 2.2-2.5, and a third layer having a refractive index in the range of 1.8-2.1 (*See e.g.*, Iida, column 2, lines 45-56). Optionally, the multilayer may comprise a fourth layer having a refractive index in the range of 2.2-2.5 and a fifth layer having a refractive index in the range of 1.8-2.1 (*See e.g.*, Iida, column 3, lines 1-7).

Hartig discloses a low E sputter coated layer system for automotive and architectural purposes of the basic Si_3N_4/Ni Cr/Ag/NiCr/S_3N_4 type, improved by either an undercoat of TiO_2 or the use of stainless steel in the Si_3N_4 layer, or both (*See e.g.*, Hartig, column 6, lines 8-18).

Claim 1, as amended, recites a transparent substrate having at least one surface comprising, on at least one of its surfaces, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, (a) wherein at least one

of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer, (b) there is at least one additional high index layer, having a refractive index of at most 2.3, and (c) the layers of low refractive index have a refractive index of between 1.30 and 1.65.

Iida fails to disclose or suggest layers with a low refractive index, having a refractive index between 1.30 and 1.65, as recited in claim 1, as amended. Rather, Iida discloses layers having a refractive index of 1.8-2.1 (*See e.g.*, Iida, column 2, lines 38-56). A refractive index of 1.8-2.1, as disclosed by Iida, is not considered by a person of ordinary skill in the art as a low refractive index (*See e.g.*, Iida, column 2, lines 38-56). A refractive index in the range of 1.8-2.1 is considered as intermediate to high. In contrast, the present invention recites a low refractive index in the range of 1.3-1.65 (*See e.g.*, Specification, page 4, lines 1-3). There is absolutely no disclosure or suggestion in Iida to have a low refractive index layer with a refractive index in the range of 1.3-1.65. Indeed, the 1.8-2.1 refractive index range that Iida recites as low, actually runs into the high index range, as disclosed by the present invention. Therefore, unlike the present invention, Iida does not disclose or suggest layers with a low refractive index. For this additional reason, Iida fails to disclose or suggest the invention recited in independent claim 1.

Hartig does not remedy the deficiencies in Iida. The Examiner cites Hartig as disclosing a high refractive index multilayer comprising titanium oxide and silicon nitride, and alleges that it would have been obvious to use the high index titanium oxide containing layer of Hartig in the film of Iida.[1] Even if Hartig is combined with Iida, however, it would not result in the present invention. Even if the titanium oxide layer of Hartig was used as a high refractive index layer in the multilayer film disclosed in Iida, it would not result in the claimed multilayer coating wherein the low refractive index layers have a refractive index between 1.3 and 1.65. Rather the combination would disclose a multilayer film having a high refractive index layer comprising titanium oxide, as disclosed in Hartig, and intermediate to

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[1] In the Office Action, the Examiner alleges "it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a multilayer antireflection film comprising titanium oxide and silicon nitride, as disclosed by Hartig, for the high refractive index film (62) of Krisko." Applicants are not clear what is meant by the reference to Krisko and assume the Examiner means "Iida."

high refractive index layers of between 1.8 and 2.1, as disclosed in Iida (rather than low refractive index layers having a refractive index between 1.3 and 1.65, as presently claimed).

Accordingly, neither Iida nor Hartig, alone or in combination, suggest the claimed multilayer coating. As explained above, neither Iida nor Hartig, alone or in combination, suggests an antireflection coating wherein the low refractive index layers have a refractive index between 1.3 and 1.65. Moreover, neither Iida nor Hartig, alone or in combination, would have provided a reasonable expectation that the presently claimed antireflection coating, which expressly recites that the low refractive index layers have a refractive index between 1.3 and 1.65, would have been successful. Indeed, the claimed antireflection coating has increased optical performance by giving the substrate greater "stability" in its appearance to reflection (*See e.g.*, Specification, page 5, lines 11-13). Therefore, Iida in view of Hartig does not render the present claims obvious.

With respect to claims 2-3, 11-16, 20-23 and 25, Applicants note that these claims depend, directly or indirectly from claim 1, which, as noted above, are not rendered obvious by Iida in view of Hartig. Accordingly, these claims are also allowable over Iida in view of Hartig. For the above reasons, Applicants respectfully request that the rejection of claims 1-3, 11-16, 20-23, and 25 under U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 24 was rejected under 35 U.S.C. § 103(a) as being obvious over Iida in view of U.S. Patent No. 5,948,544 to Kim et al. ("Kim") for the reasons set forth on pages 3-4 of the Office Action. Applicants respectfully traverse the rejection.

Kim discloses a polyester multilayer sheet and a process for preparing the sheet (*See e.g.*, Kim, column 2, lines 40-41.) The sheet has good impact strength, weatherability, and transparency (*See e.g.*, Kim, column 2, lines 40-44).

Kim fails to remedy the deficiencies in Iida or Hartig. The Examiner simply cites Kim as disclosing a polycarbonate or polyacrylate polymer in place of glass as a substrate. There is absolutely no disclosure or suggestion in Kim of a low refractive index layer having a refractive index between 1.3 and 1.65, much less as part of a multilayer with a high-index layer having a refractive index value of at most 2.40 and comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3. Therefore, Applicants respectfully request that the rejection of claim 24 under U.S.C. § 103(a) be reconsidered and withdrawn.

Claims 1-3, 11-16, 20-23 and 25 were rejected under 35 U.S.C. § 103(a) over Iida in view of U.S. Patent No. 5,821,001 to Arbab et al. ("Arbab") for the reasons set forth on pages 4-5 of the Office Action. Applicants respectfully traverse this rejection.

Arbab relates to multilayer high transmittance, low emissivity coatings on transparent substrate (*See e.g.*, Arbab, column 1, lines 47-50). Arbab discloses a high refractive index antireflective film comprising a first layer of any suitable high refractive index, such as zinc tin oxide or zinc oxide (*See e.g.*, Arbab, column 5, lines 12-46).

Arbab fails to remedy the deficiencies of Iida. As discussed, Iida fails to disclose or suggest layers with a low refractive index having a refractive index between 1.30 and 1.65, as recited in claim 1, as amended. Arbab does not remedy this deficiency. The Examiner cites Arbab as disclosing that two-part high refractive index films may be used in multilayered films, and alleges that it would have been obvious to use the two-part high refractive index films in at least one of the high refractive index layers of Iida. Even if the two-part high refractive index films of Arbab were used in one of the high refractive index layers of Iida, it would not result in the claimed mulitlayer coating wherein the low refractive index layers have a refractive index between 1.3 and 1.65. Rather the combination would disclose a multilayer film having a two-part high refractive layer as disclosed in Arbab and intermediate to high refractive index layers of between 1.8 and 2.1, as disclosed in Iida, rather than low refractive index layers having a refractive index between 1.3 and 1.65, as presently claimed.

The Examiner alleges that although Arbab does not mention use of titanium oxide in the high refractive index two-part film, it would nave been obvious to one of ordinary skill in the art to make each high refractive index layer from any suitable high refractive index material. Applicants, however, have unexpectedly discovered that titanium oxide is superior compared to other high refractive index material. Applicants have discovered that titanium oxide, unlike other higher refractive index materials, advantageously gives the coated substrate greater "stability" in its appearance in reflection while better reconciling optical performance with the requirements of economically manufacturing this type of product on an industrial scale (*See e.g.*, Specification, page 5, lines 5-10). At the time of the invention, there was no suggestion to use titanium oxide as a layer in the high index multilayer or the unexpected advantages of using titanium oxide. Therefore, it is not obvious

for one skilled in the art to obtain the present invention of claim 1 through the combination of Iida and Arbab. Since claims 2-3, 11-16, 20-23 and 25 depend from claim 1, these claims are also allowable over Iida in view of Arbab. For the above reasons, Applicants respectfully request that the rejection of claims 1-3, 11-16, 20-23, and 25 under U.S.C. § 103(a) be reconsidered and withdrawn.

Claim 24 was rejected under 35 U.S.C. § 103(a) as being obvious over Iida in view of Arbab and Kim for the reasons set forth on pages 5-6 of the Office Action. Applicants respectfully traverse this rejection.

Kim fails to remedy the deficiencies in Iida or Arbab. No combination of these references discloses or suggests all of the features of the present invention. As discussed above, the Examiner cites Kim as disclosing a polycarbonate or polyacrylate polymer in place of glass as a substrate. There is absolutely no disclosure or suggestion in Kim of a low refractive index layer having a refractive index between 1.3 and 1.65, much less such a layer in combination with high-index layer that is a multilayer having a refractive index value of at most 2.40 and comprising at least one titanium oxide layer and at least one additional high index layer having a refractive index of at most 2.3. Therefore, Applicants respectfully request that the rejection of claim 24 under U.S.C. § 103(a) be reconsidered and withdrawn.

CONCLUSIONS

Applicants believe that all pending claims are now in condition for allowance, early notice of which would be appreciated. Should the Examiner not agree with this position, a personal or telephone interview is respectfully requested to discuss any remaining issues in an effort to expeditiously advance the application to allowance.

A Petition For Extension of Time with provision for the required fee to extend the time for responding by 2 months from October 31, 2002, to and including December 31, 2002, is enclosed herewith.

Should any additional fees be due, please charge the required fees to Pennie & Edmonds LLP Deposit Account No. 16-1150.

Respectfully submitted,

Date December 13, 2002

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Enclosure

Appendix A

Change to the Claims

Application No.09/761,765; filed January 18, 2001

1. (Amended) A transparent substrate having at least one surface comprising, on at least one of its surfaces, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, (a) wherein at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer [and], (b) there is at least one additional high index layer, [wherein the additional high index layer has] having a refractive index of at most 2.3, and (c) the layers of low refractive index have a refractive index of between 1.30 and 1.65.

14. (Amended) The transparent substrate of claim 1, wherein the low index thin layers [have a refractive index between 1.30 and 1.65 and] comprise one or more of silicon oxide, aluminum oxide, aluminum oxyfluoride, aluminum fluoride, and magnesium fluoride, wherein the oxides are optionally halogenated.

Appendix B

Currently Pending Claims

Application No.09/761,765; filed January 18, 2001

1. A transparent substrate having at least one surface comprising, on at least one of its surfaces, an antireflection coating made of a multilayer stack comprising alternating thin layers of high and low refractive indices, (a) wherein at least one of the high-index thin layers has a refractive index value of at most 2.40 and is a high-index multilayer comprising at least one titanium oxide layer, (b) there is at least one additional high index layer, having a refractive index of at most 2.3, and (c) the layers of low refractive index have a refractive index of between 1.30 and 1.65.

2. The transparent substrate of claim 1, wherein the refractive index of the high-index multilayer comprising at least one titanium oxide layer is between 2.25 and 2.38.

3. The transparent substrate of claim 1, wherein the thin layers comprise a dielectric material, a low emissivity material, or a solar-protection coating.

11. The transparent substrate of claim 1, wherein the at least one additional high index layer has a refractive index of between 1.9 and 2.2 and comprises tantalum oxide, zirconium oxide, tin oxide, indium oxide, zinc oxide, silicon nitride, or aluminum nitride.

12. The transparent substrate of claim 1, wherein the high-index multilayer comprises two contiguous layers and the additional high index layer is closer to the substrate than the titanium oxide layer.

13. The transparent substrate of claim 12, wherein the absolute value of the difference between the refractive index of the additional high index layer less the refractive index of the titanium oxide layer is between 0.1 and 0.6.

14. The transparent substrate of claim 1, wherein the low index thin layers comprise one or more of silicon oxide, aluminum oxide, aluminum oxyfluoride, aluminum fluoride, and magnesium fluoride, wherein the oxides are optionally halogenated.

15. The transparent substrate of claim 14, wherein the thin layer of the antireflection coating most removed from the substrate is a low index layer comprising a SiO_2-Al_2O_3, wherein the atomic percent of aluminum with respect to silicon is from 5 to 20 percent.

16. The transparent substrate of claim 14, wherein the multilayer stack comprising alternating thin layers of high and low refractive indices antireflection coating has a formula $(\text{high-index layer/low-index layer})_n$, wherein n is 2 or 3.

20. A glazing comprising the transparent substrate of claim 1.

21. The glazing of claim 20, further comprising a layer or multilayer stack that is a solar protection layer, a heat absorbing layer, a UV protecting layer, an antistatic layer, a low emissivity layer, a heated layer, an anti-fouling layer, a hydrophobic organic layer having an anti-rain function, a hydrophilic organic layer having an anti-fogging function, or a silvering layer.

22. The glazing of claim 21, wherein the glazing comprises extra-clear glass or solid-tinted glass and wherein the glazing is optionally, toughened, reinforced, curved, or bent.

23. The glazing of claim 21, wherein the glazing comprises a transparent polymer material.

24. The glazing of claim 22, wherein the transparent polymer material comprises a polycarbonate or a polyacrylate.

25. The glazing of claim 21, for use as the internal or external glazing for buildings, to protect paintings, a motor-vehicle window, a mirror, a display screen, a decorative glass, a shop window, a shop-counter, or a refrigerated display-cabinet.